

Radiographic Validation And Reliability Of Selected Clinical Measures Of Pronation

Hannigan-Downs KS, Harter RA, Smith GA: Oregon State University, Corvallis, OR

Abnormal pronation of the foot has been associated with a wide range of injuries in the lower extremity. The navicular drop test (NDT) and Feiss' line (FL) are two clinical tests used to estimate the amount of pronation via transcutaneous measurement of inferior displacement of the tarsal navicular. Although widely used in clinical practice for decades, no published record of validation for these special tests exists. The purposes of this study were: (a) to employ radiographic imaging techniques to determine the validity of the NDT and FL measurements in normal and injured limbs, and (b) to establish the intra-examiner and inter-examiner reliability and standard error of measurement (SEM) for these clinical tests. Thirty-two patients (female and male, ages 18-65) who sought medical treatment for lower extremity pathologies were recruited to participate in the study. Radiopaque markers were placed on the medial malleolus of the tibia, navicular tubercle, and head of the first metatarsal to facilitate the calculation of the NDT and FL. Displacement of the navicular, as calculated from the radiographs, served as the criterion measure for validation of the clinical tests, and was compared with the NDT and FL test results using interclass correlation statistical analyses (Pearson r , $\alpha = .05$). Repeated measurements of NDT and FL on different days by the same certified athletic trainer, and same day comparisons between two certified athletic trainers were used to calculate intraclass correlation coefficients [ICC (2,1)] and the SEM. The NDT and FL tests had moderate to good ($r = 0.61 - 0.89$) positive correlation values, with the exception of the FL change in position value ($r = -.09$). The intra-examiner reliability results showed good to excellent consistency for all measures of the NDT and FL tests (ICC = 0.82 - 0.93). The inter-examiner reliability measures were poor to moderate for the FL test of pronation (ICC = 0.43 - 0.74), while the reliability for the NDT was moderate to good (ICC = 0.69 - 0.89). These findings suggest that the validity of the NDT was moderate, and that the FL test was weak. The intra-examiner reliability was strong for both the NDT and FL tests, while the inter-examiner reliability was moderate for the NDT and poor for the FL test. Continued use of the NDT as a clinical test of pronation was supported by our findings; however, FL test results should be used with caution.

Doctoral research grant sponsored by Active Ankle Systems, Inc.

Relationships Between Impairments, Three-Dimensional Kinematics, And Self-Report In Patients With Subacromial Impingement

Michener LA, McClure PW, Karduna AR, Sennett BJ: Department of Physical Therapy, Virginia Commonwealth University-Medical College of Virginia, Richmond, VA

Introduction: Impingement syndrome of the shoulder is a mechanical compression injury involving structures of the subacromial space. The potential factors that contribute to primary impingement syndrome are bony abnormalities, weak rotator cuff and/or scapular musculature, posterior capsular tightness, and postural dysfunctions of the spinal column and/or shoulder girdle. Theoretically, these non-kinematic factors lead to the kinematic impairments of dysfunctional glenohumeral and scapulothoracic movement patterns, which then lead to impingement syndrome and subsequent functional limitations. A theoretical model, based upon the disablement model, was developed to help elucidate the mechanisms of impingement syndrome.

Methods: Prior to examining the relationships between the various levels of disablement, the measure for the assessment of functional limitations (The American Shoulder and Elbow Surgeon's Self-Assessment Form: ASES) was assessed for reliability, validity, and responsiveness. Patients with various shoulder pathologies ($n=63$) were recruited from 12 different clinics, completing on 3 occasions the ASES, a generic measure (SF36) of overall health, and another shoulder functional limitations measure (University of Pennsylvania Shoulder Form). To examine the relationships between levels of the disablement model, subjects ($n=47$) with shoulder impingement syndrome were recruited. The impairments of AROM, strength, forward shoulder posture, thoracic spine posture, scapular and humeral kinematics and pain were collected by various methods, the ASES self-report questionnaires for functional limitations, and the Short-form 36 for a disability measure. **Results:** The ASES demonstrated an acceptable level of internal consistency, test-retest reliability, as well as construct, divergent, and discriminate validity. The error estimate with a single application (SEM) of the ASES was found to be 6.4 points, and the error estimate with repeated applications (minimal detectable change) of the ASES was 16 points. Regarding the impairment measures, there was a significant relationship between the non-kinematic measures of strength and pain with the kinematic measures of scapular posterior tilting and external rotation and glenohumeral kinematics. Additionally, there was a significant relationship between function and both kinematic and non-kinematic measures. **Discussion:** The results indicate that the ASES is a reliable, valid, and responsive outcome tool. It can be applied with confidence, utilizing the parameters of error to make

decisions regarding patient prognosis and treatment. It appears that impingement syndrome is multifactorial, therefore it should be treated as such. However, the impairments that appear to most related to functional limitations and disability is that of strength loss, pain, and abnormal scapulothoracic and glenohumeral kinematics. Clinically, by focusing treatment towards these impairments, kinematics of the shoulder and therefore function may improve. This is the future of subsequent research.

Doctoral research grant sponsored by Active Ankle Systems, Inc.

The Effects Of Creatine Supplementation On Intracellular And Extracellular Water Content

Powers ME, Arnold BL, Perrin DH, Weltman AL, Mistry D, Kahler DM, Kraemer WJ: University of Virginia, Charlottesville, VA

Immediate weight gain is a common side effect associated with creatine (Cr) supplementation. Because this weight gain occurs over a short duration, it is likely that it is due to water retention. Thus, the purpose of this study was to determine if increases in muscle total creatine (TCr) concentrations, as a result of Cr supplementation, were associated with increases in total body water (TBW) and intracellular water (ICW). Sixteen male (age = 22.8 +/- 3.0 yr., height = 179.8 +/- 7.1 cm, mass = 84.8 +/- 11.2 kg) and sixteen female (age = 21.8 +/- 2.5 yr., height = 163.4 +/- 5.9 cm, mass = 63.6 +/- 14.0 kg) subjects were measured for body mass, muscle TCr concentration (via biopsy analysis), extracellular water (ECW), TBW, and ICW. The body water measurements were obtained using deuterium oxide and sodium bromide dilution analyses. Each subject was then randomly assigned to either a Cr supplementation or placebo group in a double blind fashion. Subjects in the Cr group ingested 25-g/day Cr monohydrate (Experimental and Applied Sciences, Inc., Golden, CO) for 7 days followed by 5-g/day for 21 days. Subjects in the placebo group ingested a sugar placebo using the same protocol. Subjects were then reassessed on days 7, 14, 21, and 28 of the supplementation protocol. Mixed model ANOVAs were performed on all data and a regression analysis was used to determine the relationship between changes in muscle TCr and changes in ICW. A significant increase in muscle TCr [$F(2,48) = 4.75$, $p = .013$] was observed during Cr supplementation. The increase in muscle TCr occurred during the loading phase and was maintained throughout the maintenance phase. Both groups experienced significant increases in body mass [$F(4,112) = 2.44$, $p = .05$] and TBW [$F(2,56) = 3.86$, $p = .027$] during the supplementation period. The Cr group experienced a greater body mass on days 7, 14, 21, and 28 as compared to pre-supplementation, while the placebo group experienced a greater body mass on day 14 only. The Cr group also experienced increases in TBW during both the loading and maintenance phases while the placebo group experienced an increase during the loading phase only. These increased TBW appeared to be the result of non-significant changes in both the ECW and ICW contents. These results suggest that Cr supplementation is associated with an increased TBW, however, this is not due to an increased ICW content.

This study was funded by the NATA Research & Education Foundation.

Psychological Distress Following Athletic Injury

Perna F, Roh J, Newcomer R, Maniar S, Stilger V: West Virginia University, Morgantown, WV

An estimated 17 million athletic injuries occur annually of which a substantial portion are thought to be accompanied by significant psychological distress which in turn is thought to influence rehabilitation treatment compliance. However, because few studies have employed adequate control groups and no published study has included pre-injury assessment, accurate data regarding the severity and duration of psychological distress and reactive depression as a result of injury has been difficult to ascertain. Moreover, although the National Athletic Trainers Association (NATA) requires certified athletic trainers to be knowledgeable regarding psychological aspects of injury and includes counseling as a competency area, a recent national survey revealed that many athletic trainers feel unprepared to adequately address psychological issues that may arise. Data and experience gained from the present study can be used to educate athletic trainers to facilitate athletes' emotional adjustment to injury and enhance athletes' satisfaction with care and possibly treatment compliance. The present study assessed the extent, severity, and duration of psychological distress among men and women high school and collegiate athletes incurring a severe athletic injury. Additionally, athletic trainers' assessment of injured athletes' psychological distress was gathered and correlated with athletes' self-report. Four major findings were derived from the study. 1) After accounting for relevant control factors, injured athletes experienced more psychological distress in the form of self-reported and clinician-rated depression than noninjured athletes. 2) Injured athletes were also more likely than non-recently injured athletes to report the presence of bothersome intrusive thoughts regarding an athletic injury which appeared to persist beyond the period of full physical recovery from injury. 3) Beyond severity of injury and post-injury negative mood state, pre-injury negative mood and specific behavioral disruptions (e.g., sleep disruption and anhedonia) are particularly salient in identifying injured athletes at risk for further psychological maladjustment and possible formal mood disorder diagnoses. 4) With respect to their emotional response to injury, athletes showed a clear preference for speaking with athletic trainers as compared to coaches and other sports medicine professionals. However, athletic trainers' ratings of athletes' level of psychological distress was poorly correlated with athletes' self-reported distress. These data will be discussed with respect to specific behaviors and brief interview techniques that athletic trainers may use to better assess psychological distress and identify athletes at risk for more serious psychological disturbance.

This study was funded by the NATA Research & Education Foundation.

Selection And Evaluation Guidelines For Clinical Education Settings In Athletic Training

Weidner TG, Laurent TG: Ball State University, Muncie, IN

The responsibility to provide quality clinical education experiences within athletic training education programs is increasing dramatically. Availability of high quality clinical education settings is vital to the profession of athletic training. The purpose of this study was to develop and test standards and associated criteria for the selection and evaluation of a clinical education setting in athletic training. A previously validated set of 20 physical therapy clinical education setting standards, criteria, and 2 related evaluation forms were systematically revised and adapted through a survey process. Program directors, clinical instructors, and students involved with athletic training clinical education (representing college/university, high school, and clinic-based settings) from 28 NATA-approved or CAAHEP-accredited athletic training education programs participated in this study. Respondents' critiques and ratings were tabulated by type of respondent. Items were judged as to whether they were relevant, clear, practical, and predictive of high quality clinical education settings. We accepted a final set of 12 standards and 31 associated criteria to measure these standards. The student form lists 23 criteria relevant to these accepted standards. The accepted standards are as follows: learning environment; program planning; learning experiences; ethical standards; administrative support; effective communications; staff number; clinical instructor selection; principles of teaching and learning; professional associations; adequate space; and setting coordinator of clinical education. The 12 standards/criteria and related forms developed in this research project are considered relevant, clear, practical, and predictive of high quality clinical education settings (clinic-based, college/university, high school) in athletic training. These standards/criteria should be used as guidelines rather than as minimal requirements. They could be helpful in forming an impression not only about a particular clinical setting, but also about the requirements of clinical education in general. Further research should include evaluating and comparing perceptions among genders and ethnic groups concerning their clinical education experiences. Also, standards/criteria for clinical instruction in athletic training should be systematically developed.

This study was funded by the NATA Research & Education Foundation.